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A UNIFIED INTER-CARRIER COMPENSATION MECHANISM FOR ALL FORMS OF INTERCONNECTION: CALLING PARTY'S NETWORK PAYS OR BILL AND KEEP?

Reply Declaration

Of

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I. INTRODUCTION

A. Statement of Qualifications

Dr. William E. Taylor

1. My name is William E. Taylor. I am Senior Vice President of National Economic Research Associates, Inc. ("NERA"), head of its Communications Practice, and head of its Cambridge office located at One Main Street, Cambridge, Massachusetts 02142.

2. I have been an economist for over twenty-five years. I earned a Bachelor of Arts degree from Harvard College in 1968, a Master of Arts degree in Statistics from the University of California at Berkeley in 1970, and a Ph.D. from Berkeley in 1974, specializing in Industrial Organization and Econometrics. For the past twenty-five years, I have taught and published research in the areas of microeconomics, theoretical and applied econometrics, which is the study of statistical methods applied to economic data, and telecommunications policy at academic and research institutions. Specifically, I have taught at the Economics Departments of Cornell University, the Catholic University of Louvain in Belgium, and the Massachusetts Institute of Technology. I have also conducted research at Bell Laboratories and Bell Communications Research, Inc. I have participated in telecommunications regulatory proceedings before several state public service commissions.

3. I have also filed testimony before the Federal Communications Commission ("FCC") and the Canadian Radio-television Telecommunications Commission on matters concerning incentive regulation, price cap regulation, productivity, access charges, local competition, interLATA competition, interconnection and pricing for economic efficiency. Recently, I was chosen by the Mexican Federal Telecommunications Commission and Telefonos de Mexico ("Telmex") to arbitrate the renewal of the Telmex price cap plan in Mexico.

4. I have also testified on market power and antitrust issues in federal court. In recent work years, I have studied—and testified on—the competitive effects of mergers among major

telecommunications firms and of vertical integration and interconnection of telecommunications networks. Finally, I have appeared as a telecommunications commentator on PBS Radio and on The News Hour with Jim Lehrer. My *curriculum vitae* is attached as Exhibit 1.

Dr. Aniruddha Banerjee

5. My name is Aniruddha Banerjee. I am a Senior Consultant with the Communications Practice at NERA.

6. I earned a Bachelor of Arts (with Honors) and a Master of Arts degree in Economics from the University of Delhi, India, in 1975 and 1977, respectively. I received a Ph.D. in Agricultural Economics from the Pennsylvania State University in 1985, and served there subsequently as an Assistant Professor of Economics. I have over eight years of experience teaching undergraduate and graduate courses in various fields of economics and econometrics, and have conducted academic research that has led to publications and conference presentations.

7. Since 1988, I have held various positions in the telecommunications industry. Prior to my present position, I have been an economist in the Market Analysis & Forecasting Division at AT&T Communications in Bedminster, NJ, a Member of Technical Staff at Bell Communications Research in Livingston, NJ, and a Research Economist at BellSouth Telecommunications in Birmingham, AL. In these positions, I conducted economic and market analysis, building quantitative demand models for telecommunications services, developing economic positions and strategies, and providing expert testimony on regulatory economic matters. In my present capacity, I have filed expert testimony before the FCC on depreciation requirements of incumbent local exchange carriers, BellSouth's entry into interLATA long distance market in Louisiana, and efficient inter-carrier compensation for Internet-bound traffic. I have also testified before state regulatory commissions on cost models for unbundled network element pricing, interconnection arrangements and imputation analysis, universal service, reciprocal compensation for Internet-bound traffic, and demand analysis for intraLATA long distance service. My *curriculum vitae* is attached as Exhibit 2.

B. Purpose of NERA Reply Declaration

8. Interconnection is fundamental to the healthy functioning of a competitive telecommunications industry. With the passage of the Telecommunications Act of 1996 ("1996 Act") and subsequent rulemaking by the Federal Communications Commission ("FCC"), it has now become possible for new telecommunications service providers to enter without having to first create elaborate—and expensive—networks of their own. Changes in law and public policy have also provided these new entrants an opportunity to develop their own innovative services and pursue niche market areas, without being constrained to merely resell the services offered by incumbent telecommunications service providers.

9. With network interconnection, the costs of communications (calls) that traverse the networks of different telecommunications carriers are distributed and have traditionally required a system of carrier-to-carrier payments (or "inter-carrier compensation") for their complete recovery. With guidance from the 1996 Act, the FCC has developed the rules of interconnection and, in particular, specific forms of inter-carrier compensation for the different types of traffic, namely, local voice, long distance voice, and data and Internet-bound. Although the inter-carrier compensation mechanisms in place for voice calls have been, for the most part, uncontroversial, those for data calls (in particular, calls made to Internet destinations) have been far more contentious.

10. In the absence of firm public policy guidelines, a patchwork of compensation mechanisms have emerged around the country for data traffic interconnection. Worse yet, those mechanisms have been cobbled together based on little or *ad hoc* economic justification. Unfortunately, other longstanding public policies have also interfered with prospects for implementing economically most efficient systems of inter-carrier compensation. The protracted battle among various interest groups over compensation rules for carrier interconnection has prompted the FCC to commence a new round of rulemaking. In this effort, the FCC wishes not only to determine what the appropriate compensation policy should be for data and Internet-bound traffic that traverse interconnected networks, but also

to design a unified policy which would apply simultaneously to *all* forms of traffic being carried under interconnection arrangements.

11. In April 2001, the FCC initiated the search for a unified inter-carrier compensation policy.[1] In response, various parties filed comments on August 21, 2001. In keeping with the *NPRM*'s mission, parties submitted their views on (1) whether, with suitable reforms, existing regimes of inter-carrier compensation can be retained and serve as a unified regime for all forms of interconnection, and (2) whether an alternative mechanism called "bill and keep"—and two specific forms proposed for it—would better serve that purpose.[2] One of the parties, BellSouth Corporation ("BellSouth"), has asked that we respond to comments on economic matters submitted by four parties: AT&T Corporation ("AT&T"), WorldCom Corporation ("WorldCom"), Time Warner, Inc. ("Time Warner"), and Pac-West Telecomm, Inc., Focal Communications Corporation, and US LEC Corporation ("Pac-West et al.").[3] BellSouth has also asked that we offer our own economic perspective on a unified inter-carrier compensation mechanism, as sought by the *NPRM*.

12. The plan of this Reply Declaration is as follows. We first review existing inter-carrier compensation mechanisms for different forms of interconnection. Second, we summarize and review the economic issues raised by the *NPRM*. Third, we discuss why, given current and foreseeable future circumstances in the telecommunications industry, bill and keep should be the preferred public policy. In this context, we explain why the form of compensation labeled by the FCC as "Calling Party's Network Pays" ("CPNP") can only be

[1] FCC, *In the Matter of Developing a Unified Intercarrier Compensation Regime*, CC Docket No. 01-92, Notice of Proposed Rulemaking ("*NPRM*"), released April 27, 2001.

[2] The two variants of bill and keep on which the FCC asked parties to comment are Central Office Bill and Keep ("COBAK") and Bill Access to Subscribers-Interconnection Cost Split ("BASICS"). These variants had been proposed earlier by analysts at the FCC. See Patrick DeGraba, *Bill and Keep at the Central Office as the Efficient Interconnection Regime*, FCC OPP Working Paper No. 33, December 2000, and Jay M. Atkinson and Christopher C. Barnekov, *A Competitively Neutral Approach to Network Interconnection*, FCC OPP Working Paper No. 34, December 2000.

[3] See *Declaration of Janusz A. Ordover and Robert D. Willig* on behalf of AT&T Corporation ("*Ordover-Willig*"), *Declaration of Patrick DeGraba* on behalf of WorldCom ("*DeGraba*"), *Analysis of Central Office Bill and Keep ("COBAK")* by Joseph Farrell and Benjamin E. Hermalin on behalf of Time Warner ("*Farrell-Hermalin*"), and *Efficient Intercarrier Compensation Mechanisms for the Emerging Competitive Environment* by Lee L. Selwyn and Scott C. Lundquist on behalf of Pac-West et al. ("*Selwyn-Lundquist*").

economically efficient under ideal circumstances which do not now exist, and cannot be expected in the foreseeable future either. Fourth, we catalog distortions—both regulatory and market-related—that are likely to keep any CPNP-based compensation mechanism from functioning as intended and delivering on its promise of efficiency. Instead, we explain why, in the presence of multiple distortions, bill and keep may be more effective for mitigating perverse incentives for uneconomic arbitrage and providing incentives for investment and efficient pricing. Finally, we examine suggestions by the four parties (cited above) that CPNP-based compensation could be made to work effectively in the presence of distortions simply by setting all interconnection charges at forward-looking incremental cost levels.

13. Experience has shown that cost-causative compensation mechanisms that are most efficient and welfare-maximizing *in theory* do *not* perform well, or even adequately, when pervasive regulatory and market distortions prevent such mechanisms from operating as intended. Although bill and keep is not, in itself, cost-causative and, therefore, not the likely instrument of choice when markets operate free of distortions, we believe that its use in distorted markets in place of allegedly cost-causative mechanisms like CPNP may have significant salutary effects, principally by suppressing perverse incentives to conduct uneconomic arbitrage.

C. Existing Inter-Carrier Compensation Mechanisms for Various Forms of Interconnection

14. Currently, there are three forms of interconnection among wireline carriers within the circuit-switched public switched telephone network ("PSTN"). First, local exchange carriers ("LECs") interconnect with other LECs for the exchange of local voice calls (made by end-users of one LEC to end-users of the other). Second, LECs and inter-exchange carriers ("IXCs") interconnect for the purpose of completing long distance voice calls, where the LECs themselves do not provide long distance service to the calling or called parties. Third, LECs interconnect with other LECs that serve Internet service providers ("ISPs") that facilitate communications with Internet destinations, and provide electronic mail and other services.

15. Each form of interconnection requires the participation of two or more carriers. As a result, a call that requires interconnection for its transport and completion generates costs that are distributed across the various interconnecting carriers. Typically, these costs pertain to call origination and call termination, respectively, at the two ends of the call, and transport (or transmission) in between. Currently, these costs are recovered by some combination of end-user charges and carrier-to-carrier payments.

16. First, under LEC-LEC interconnection for the exchange of a local voice call, the *originating* LEC (i.e., the LEC whose end-user initiates the cross-network local voice call) recovers the end-to-end cost of the call from its own end-user and then compensates the *terminating* carrier (i.e., the LEC whose end-user is the recipient of the cross-network local voice call) for *its* costs of termination and/or transport. This LEC-LEC payment is a form of inter-carrier compensation known as *reciprocal compensation*.

17. Second, under LEC-IXC interconnection for the carriage of a long distance voice call, the typical network arrangement is for the originating LEC (whose end-user initiates the call) to hand off the call to an IXC which then transports that call to a terminating LEC (whose end-user receives the call). The IXC requires access to the end-users at both ends of the long distance voice call and, in so doing, gives rise to costs for both originating and terminating LECs when their networks are used for such access. The IXC recovers the end-to-end cost of the call from its long distance customer (namely, the end-user that originates the long distance voice call), and compensates the two LECs for their costs of call origination and call termination, respectively. This IXC-LEC payment is a form of inter-carrier compensation known as *carrier access charges*.

18. Third, under LEC-LEC interconnection for the carriage of calls to and from Internet destinations through ISPs, the typical network arrangement is for the LEC whose end-user initiates the Internet-bound call to deliver that call to the LEC that serves the ISP, at which point the ISP transmits that call to its Internet destination through the packet-switched network. Unlike voice calls, this type of call traverses both the circuit-switched PSTN (between the end-user and the ISP) and the packet-switched network (between the ISP and the Internet destination).

19. Inter-carrier compensation for the portion of the Internet-bound call that lies *within* the PSTN, however, has always been a contentious matter. Without FCC guidance in the matter, several states treated interconnection for such calls in the same way as interconnection for local voice calls for the purposes of inter-carrier compensation. When several *incumbent* LECs ("ILECs") balked at the idea of paying reciprocal compensation for Internet-bound traffic (at the same rate that applies to local voice calls), and argued that the similarity between interconnection for such traffic and for long distance voice traffic merited something akin to carrier access charges instead, the FCC issued a ruling agreeing that Internet-bound calls are "largely interstate" and "jurisdictionally mixed," but left it up to individual states to decide whether to apply reciprocal compensation or some other compensation arrangement to those calls.[4] Most importantly, the FCC extended to ISPs the exemption granted to enhanced service providers ("ESPs") from paying access charges even when long distance communications were involved.[5] In other words, the FCC decided to treat ISPs as "end-users" solely for the purpose of receiving the exemption from access charges. Following these decisions, while the majority of states retained reciprocal compensation for Internet-bound traffic, other states implemented bill and keep as the form of inter-carrier compensation for Internet-bound traffic.[6] As a mishmash of compensation

[4] FCC, *In the Matter of Implementation of the Local Competition Provisions in the Telecommunications of 1996* (CC Docket No. 96-98) *and Inter-Carrier Compensation for ISP-Bound Traffic* (CC Docket No. 99-68), Declaratory Ruling in CC Docket No. 96-98 and Notice of Proposed Rulemaking in CC Docket No. 99-68 ("*ISP Declaratory Ruling*"), released February 26, 1999.

[5] FCC, *In Re: MTS and WATS Market Structure*, CC Docket No. 78-72, Memorandum Opinion and Order ("MTS/WATS Order"), 1983.

[6] Among those rejecting reciprocal compensation were Massachusetts, New Jersey, South Carolina, and Louisiana. See Massachusetts Department of Telecommunications and Energy, *Complaint of MCI WorldCom, Inc., Against New England Telephone and Telegraph Company d/b/a Bell Atlantic-Massachusetts for Breach of Interconnection Terms Entered Into Under Sections 251 and 252 of the Telecommunications Act of 1996*, Docket No. 97-116-C, Order, May 1999; New Jersey Board of Public Utilities, *In the Matter of the Petition of Global Naps, Inc. for Arbitration of Interconnection Rates, Terms, Conditions and Related Arrangements with Bell Atlantic-New Jersey Pursuant to Section 252(b) of the Telecommunications Act of 1996*, Docket No. T098070426, Order, July 7, 1999; South Carolina Public Service Commission, *In re Petition for Arbitration of ITC^DeltaCom Communications, Inc. With BellSouth Telecommunications, Inc. Pursuant to the Telecommunications Act of 1996*, Docket No. 1999-259-C, Order No. 1999-690, Order on Arbitration, October 4, 1999; Louisiana Public Service Commission, *In re Petition of KMC Telecom, Inc. Against BST to Enforce Reciprocal Compensation Provisions of the Parties' Interconnection Agreement*, Order in Docket No. U23839, October 13, 1999; and Iowa Utilities Board, *In re Arbitration of Sprint Communications Company L.P., and U S WEST Communications, Inc., n/k/a Qwest Corporation*, Docket No. ARB-00-1, Arbitration Order, December

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methods began to emerge for Internet-bound traffic, and several states expressed a desire to wait for more definitive guidance from the FCC, the latter agency issued its *Internet Remand Order* in which it instituted an interim inter-carrier compensation scheme[7] while moving at the same time, through its *NPRM,* to explore the possibility of devising a unified mechanism of inter-carrier compensation for *all* forms of interconnection.

D. Issues Raised by FCC's NPRM

20. The *NPRM* seeks "an approach to intercarrier compensation that will encourage efficient use of, and investment in, telecommunications networks, and the efficient development of competition."[8] The predicate for this objective is that existing inter-carrier compensation mechanisms are beset with problems and cannot, as they are presently designed, offer a single unified mechanism for all forms of interconnection. The *NPRM* identifies the following problems in particular:[9]

- Reciprocal compensation for Internet-bound traffic creates opportunities for regulatory arbitrage by competitive local exchange carriers ("CLECs") who serve ISPs exclusively. These CLECs generate significant asymmetric traffic flows, with large volumes of Internet-bound calls coming to them (and then to the ISPs they serve) but with few calls being returned to ILECs. As the FCC recognizes, traffic imbalances that are created by "regulatory opportunities that disconnect cost from end-user market decisions" result in significant reciprocal compensation revenues to the CLECs and subsidies to the ISPs those CLECs serve.[10]

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21, 2000. Colorado and Arizona ordered bill and keep for Internet-bound traffic. See Colorado Public Utilities Commission, *Initial Commission Decision*, Docket No. 00B-011T, May 5, 2000. This decision was affirmed in the Colorado Commission's *Decision Denying Application for Rehearing, Reargument, or Reconsideration*, adopted June 7, 2000. Also, Arizona Corporation Commission, *In the Matter of the petition of Sprint Communications Company, L.P. for Arbitration of Interconnection Terms, Conditions and Related Arrangements with U S WEST Communications, Inc.*, Docket Nos. T-02432B-00-0026 and T-01051B-00-0026, Decision No. 62650, June 13, 2000.

[7] FCC, *In the Matter of Implementation of the Local Competition Provisions in the Telecommunications of 1996* (CC Docket No. 96-98) *and Inter-Carrier Compensation for ISP-Bound Traffic* (CC Docket No. 99-68), Order on Remand and Report and Order ("*Internet Remand Order*"), released April 27, 2001.

[8] *NPRM*, ¶2.

[9] *NPRM*, ¶¶11-18.

[10] *NPRM*, ¶5.

- Another opportunity for regulatory arbitrage arises from applying different compensation policies to different types of calls that are essentially similar. Presently, IXCs pay carrier access charges to LECs for long distance voice calls, but ISPs that provide Internet Protocol ("IP") telephony (for similar long distance voice calls) do not pay such charges due to the ESP exemption. This provides a strong incentive for IXCs to adopt IP telephony themselves, i.e., to mask their operations as those of ISPs, and avoid paying access charges. As the FCC puts it: "[A]ny discrepancy in regulatory treatment between similar types of traffic or similar categories of parties is likely to create opportunities for regulatory arbitrage."[11]

- Presently, the only way for calls to be delivered to a terminating end-user (or called party) is through the single LEC (of that end-user's choosing) that provides all terminating access. This gives a carrier serving the originating end-user (or caller) no opportunity to affect the access rate that it must pay the terminating LEC. In describing this "terminating access monopolies" problem, the FCC notes that it is particularly acute in CLEC-IXC relationships: "[A] number of CLECs, whose terminating access charges are not regulated, have taken advantage of this situation by charging terminating access rates that significantly exceed those charged by rate-regulated ILECs."[12]

- The payment of reciprocal compensation at symmetrical rates (that apply in both directions) is extremely problematic when the termination costs of interconnecting carriers differ. This is particularly so when public policy sets the compensation rate at the ILEC's forward-looking, traffic-sensitive termination cost for a local voice call, and requires that that rate be applied to other forms of traffic as well, such as Internet-bound calls sent through CLEC-served ISPs. In these instances, CLECs specializing in one-way traffic and serving only ISPs may have networks with lower traffic-sensitive costs than those of "full service" ILECs. Such cost differences can derive from technology differences (e.g., lower cost of specialized switches) or differences in the duration, time of day or other characteristics of the traffic. For example, the traffic-sensitive termination costs of interconnected wireline and wireless carriers may also differ partly due to the different characteristics of wireline and wireless termination.

- When carriers pay traffic-sensitive interconnection charges, but can only recover their costs in flat-rate fixed retail rates from their end-users, a mismatch is created between the structure of costs and the structure of retail rates. Traffic-sensitive interconnection charges are real marginal costs to carriers, and recovering them from end-users is problematic. Simply adding the traffic-sensitive interconnection charge to the fixed end-user local exchange price would depress usage inefficiently, or create a two-tiered

[11] *NPRM*, ¶12.

[12] *NPRM*, ¶13.

system of retail prices in which end-users making cross-network calls pay more than those who make no calls outside the network at all.

- Inefficiently structured or above-cost termination charges that are passed on to end-users result in inefficient retail rates that, in turn, distort end-users' subscription decisions. Subscribers could claim to be networks, rather than end-users to avoid retail termination rates, or they could seek out larger LECs for which most local calls are likely to be terminated within, rather than outside, their own networks. This defection by end-users to larger LECs could inefficiently discourage competition from smaller LECs.

21. The *NPRM* asks for solutions to these problems with existing compensation mechanisms. Specifically, the *NPRM* asks whether the solution lies in tinkering with those existing mechanisms (all based on the CPNP principle), or in bill and keep, a mechanism under which (1) all carrier-to-carrier payments are eliminated and (2) all carriers recover their costs—even those caused by terminating calls that originated on other carriers' networks—from their own end-users. Noting that two specific forms of bill and keep, COBAK and BASICS, have recently been proposed to solve the problems associated with current compensation mechanisms, the *NPRM* asks whether either form of bill and keep can serve as a unified inter-carrier compensation mechanism for all forms of interconnection.

22. Comments filed by various parties in response to the *NPRM* fall into one of three categories. Some parties argue for the retention of existing CPNP-based compensation mechanisms in a modified form, i.e., with interconnection charges set at forward-looking incremental cost, but reject bill and keep in any form. A second group of commenters argue that CPNP-based mechanisms cannot fully solve the problems identified in the *NPRM*, and that some form of bill and keep should be implemented. Yet others take a "wait and see" position.[13] For the purposes of this Reply Declaration, we note that the economists who have submitted comments on behalf of AT&T, WorldCom, Time Warner, and Pac-West et al. have all rejected bill and keep and, to varying degrees, advocated the retention of CPNP-based compensation mechanisms with modifications. Professors Farrell

[13] For example, some parties would prefer more study, particularly of carrier access charges in a broader context, or wait until the expiration of the current interstate access charge regime in 2005. Others invoke the need to examine the implications of the reforms proposed in the *NPRM* for federal and state universal service support programs.

and Hermalin, filing comments on behalf of Time Warner, attack the efficiency of bill and keep, whether as COBAK or BASICS. Professors Ordover and Willig, filing on behalf of AT&T, rely on theoretical arguments to explain why any compensation mechanism that is not based on cost causation cannot be economically efficient. Similar reasoning underlies the comments filed by Dr. Selwyn and Mr. Lundquist, on behalf of Pac-West et al., who would retain the status quo with interconnection charges set at total element long run incremental cost ("TELRIC"). Finally, filing on behalf of WorldCom, Dr. DeGraba (the architect of COBAK) warns against relying on COBAK without first addressing a number of critical implementation issues (primarily with respect to the alleged market power of ILECs).

II. BILL AND KEEP IS THE PREFERRED UNIFIED INTER-CARRIER COMPENSATION MECHANISM FOR ALL FORMS OF INTERCONNECTION

A. Bill And Keep Is The Preferred Public Policy Under Current And Foreseeable Future Circumstances

23. Economic theory provides valuable guidance for the formulation of public policy, as, in the present instance, for designing a unified inter-carrier compensation mechanism. We believe, however, that the prescriptions offered by economic theory for public policy should first be tested for their applicability and efficacy in the *actual* circumstances for which that policy is being designed. There is a long tradition in economic theory of just such a practice. While the development of such theory has always been motivated by the need to find the economically most efficient (or welfare-maximizing) solution to a given problem, economists have also recognized that "first-best," i.e., the most efficient, solutions are not always available or useful in the presence of constraints or distortions. In that context, the policy-maker has the task to decide which solution best fits the need at hand, and to seek the best combination of (or compromise between) competing yardsticks such as economic efficiency, distributive and competitive equity, ease of implementation and enforcement, legislative or legal imperatives such as universal service, and, in many instances, political

appeal or consumer preferences such as flat-rate local service.[14] In other words, public policy-making is a complex process of decision-making in the presence of constraints and distortions, and is usually far wider in scope than behaviors or actions that lead to *privately* first-best outcomes.

24. While economic efficiency could be the cornerstone of any search for a unified inter-carrier compensation mechanism, several regulatory and market constraints—such as those listed below—make it necessary to search for policy options that are most likely to ameliorate the problem of uneconomic arbitrage that arises in their presence. The regulatory and market distortions in question are:

- implicit subsidies used to fund universal service
- jurisdictional and accounting separations (leading to multiple sources of regulation, often beyond the FCC's control)
- flat-rated pricing for services with a mix of traffic-sensitive and traffic-insensitive costs
- rate averaging across widely varying costs
- requirement of symmetric reciprocal compensation despite differences in terminating costs
- FCC's ESP exemption that allows ISPs to avoid paying for usage-sensitive costs they impose on originating LECs

25. The first two distortions affect LEC-IXC interconnection relationships. Ever since their inception, access charges have contributed to the subsidy for residential flat-rated local exchange (or "1FR") service. Although the extent of that contribution has declined over time (with the greatest such decline occurring in *inter*state access charges), access charges remain above incremental cost.[15] Arguably, despite the historically low levels of

[14] The FCC evidently holds a similar view. See *NPRM*, ¶31.

[15] In mid-2000, the Coalition for Affordable Local and Long Distance Service ("CALLS")—comprising of AT&T, Bell Atlantic, BellSouth, GTE, SBC, and Sprint—agreed on interstate access charges at historically low levels. See FCC, *In the Matter of Access Charge Reform* (CC Docket No. 96-262), *Price Cap Performance Review for Local Exchange Carriers* (CC Docket No. 94-1), *Low-Volume Long-Distance Users* (CC Docket No. 99-249), and *Federal-State Joint Board On Universal Service* (CC Docket No. 96-45), Sixth Report and Order

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contribution currently in them, interstate access charges continue to contribute to both 1FR service and the recovery of LECs' shared and common costs. Without comprehensive universal service reform at both the federal and state levels, the implicit support provided to 1FR service by access charges today cannot be made explicit. The conversion of universal service support from implicit (price-based) to explicit (fund-based) sources was envisioned by Section 254(d) of the 1996 Act, but has yet to be fully implemented. Without total elimination of all implicit subsidies, access charges in both federal and state jurisdictions cannot be set at supposedly first-best efficient levels.[16] Another distortion embedded in access charges currently is introduced by jurisdictional and accounting separations. Because of this, interstate and intrastate access charges are subject to separate sources of regulation and, consequently, often diverge despite the fact that the underlying services are fundamentally similar.

26. The last four distortions listed above affect LEC-LEC interconnection relationships. First, retail prices paid for 1FR service are flat-rated despite the fact that the costs incurred to provide that service are a mixture of traffic-sensitive and traffic-insensitive costs. This problem, duly noted in the *NPRM* in the context of traffic-sensitive interconnection charges, frequently leaves LECs unable to design retail price structures and levels that match the corresponding costs. As a result, an end-user subscribing to 1FR service can make virtually unlimited use of all components of that service including cross-network local voice, data, or Internet-bound calls that give rise to traffic-sensitive termination or delivery costs on other

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in CC Docket Nos. 96-262 and 94-1, Report and Order in CC Docket No. 99-249, and Eleventh Report and Order in CC Docket No. 96-45, ("*CALLS Order*"), released May 31, 2000.

[16] First-best efficient access charges are those set *exactly* at long run incremental cost. Several commenters have suggested that the measure of long run incremental cost should be TELRIC, although we note that other measures are possible, even preferable. But, as we explain later in this Reply Declaration, access charges set exactly at forward-looking incremental cost is neither the real issue nor likely to help with the *NPRM*'s quest. First, when faced with the need to recover substantial shared and common costs, LECs *are* entitled to include markups in access charges that help towards that recovery. Obviously, this would still keep access charges above incremental cost, even after the implicit subsidies to universal service have been removed. Second, the real problem is the compounded effects of existing distortions. That problem would remain whether or not access charges were set at TELRIC or some other level.

networks without incurring usage-sensitive costs. This arrangement is inherently inefficient because it prevents end-users from facing the true economic costs of their calling decisions.

27. Second, excessive rate averaging is responsible for creating arbitrage opportunities. For example, the current obligation of LECs to charge geographically averaged retail rates for their services, despite wide variations in underlying costs across their service areas, creates opportunities for new entrants in the local exchange to target only the market segments in which averaged retail prices exceed the true costs to serve those segments. The arbitrage that occurs as a result is not, however, self-curing because the price-cost gap is a regulatory creation, not a market aberration that could disappear in response to the arbitrage.[17]

28. Third, as noted by the *NPRM*, reciprocal compensation for Internet-bound calls at the same symmetrical rates that apply to local voice calls creates a significant risk of regulatory arbitrage. By design, these rates reflect the ILEC's forward-looking termination cost for local voice calls and may have no relationship to an ISP-specializing CLEC's cost to deliver Internet-bound calls to ISPs. As recognized by the *NPRM*, in instances in which an ISP-specializing CLEC can choose to configure a network that (1) is set up mainly to receive, rather than, originate traffic and (2) avoids many of the traffic-sensitive costs of a full-service local network, that CLEC is in a position to earn a substantial margin between the termination rate it charges the LEC that originates the Internet-bound traffic and the termination or delivery cost that it *actually* incurs. This opportunity for arbitrage profits, coupled with freedom from the traditional service obligations of ILECs, was arguably an important reason for the proliferation of CLECs before recent FCC actions to lower compensation rates and state actions to replace reciprocal compensation for Internet-bound traffic with bill and keep applied the brakes on such growth.[18] With a share of those

[17] Arbitrage may be called "self-curing" if the act of arbitrage itself removes the temporary distortion that gave rise to it.

[18] Opportunities for regulatory arbitrage profits may be seized by entities other than ISP-specializing CLECs as well. For example, sham networks are sometimes created to generate very long periods of one-way "traffic" from end-users of ILECs to end-users of CLECs. In reality, these are merely circuits that are kept open for long periods even though no actual voice or data flows occur. Because these open circuits maintain call paths through the switches of both the ILEC (at the originating end) and the CLEC (at the terminating end), reciprocal compensation becomes due to the CLEC. The *NPRM* (¶18) acknowledges this fact as one of the problems created by a CPNP regime. AT&T disagrees, claiming that the sham network problem cannot be attributed to

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regulatory arbitrage profits flowing to ISPs, it can be inferred that competition among ISPs forces a passthrough of a portion of that subsidy on to Internet end-users and inefficiently increases the demand for Internet access as well.

29. Finally, the FCC's ESP exemption from paying access charges also creates distortions. Although ISPs have only recently been added to the list of carriers that qualify for that exemption, there is increasing concern (as reflected in the *NPRM*) that even mainstream carriers like IXCs are using technological means to take advantage of the exemption. The ESP exemption allows ISPs to be treated as "end-users" by the LECs that serve them, and makes them eligible to purchase local access under flat-rated prices, rather than under traffic-sensitive access (or analogous) charges. Coupled with the subsidy passing through them to Internet end-users, it can be inferred that the low flat-rated charges faced by those end-users for Internet access are distorted in both structure and level, and are likely to raise Internet usage to above-efficient levels.

30. We believe that an appropriate form of bill and keep represents the best hope for answering the call of the *NPRM*. While bill and keep is not based on the principle of cost causation, there are three important reasons for favoring it as the single, unified compensation mechanism in the presence of the distortions described above. First, bill and keep simplifies cost recovery significantly by eliminating the need for carrier-to-carrier payments and conserving transactions costs. These transactions costs include not merely the administrative costs associated with monitoring and recording traffic to be billed to other

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CPNP, but, rather, must be seen as instances of "abuse of the system" by individual entities. [*Comments of AT&T Corporation*, at 19] AT&T also maintains that creating a sham network is costly and, hence, unlikely to be anything more than a rare event. We believe that AT&T's position is contradicted by the facts. The best known case of a sham network occurred in North Carolina a few years ago when US LEC of North Carolina (a CLEC) was found responsible by the North Carolina Utilities Commission for creating such a network solely for the purpose of earning reciprocal compensation revenues. See NCUC, *Order Denying Reciprocal Compensation*, Docket No. P-561, Sub 10, March 30, 2000. While this is not a failing of CPNP *per se*, it is an outcome that can only arise under CPNP-based compensation, albeit at symmetrical rates unrelated to carriers' actual costs. Even requiring carriers to charge no more for their interconnection-related costs than the forward-looking level of those costs (as AT&T suggests) may not remove the incentive to create sham networks entirely if CLECs do not—and cannot be made to—disclose their true forward-looking costs. In contrast, bill and keep removes entirely any uncertainty about actual termination costs and, therefore, the possibility of arbitrage.

carriers and the entire billing and collections process itself, but also costs associated with dispute settlement, litigation, and enforcement. In the background lurk questions about the appropriate measures of cost underlying different forms of traffic among interconnected carriers and the ability to estimate those costs to the satisfaction of all parties. As the recent history of interconnection so tellingly shows, these issues are not trivial and the amount of money at stake—the carrier-to-carrier payments themselves—is certainly not negligible.

31. Second, doing away with carrier-to-carrier payments also eliminates opportunities for uneconomic arbitrage and inefficient entry that arise because of existing distortions. This fact addresses a significant part of the FCC's concerns with current compensation mechanisms.

32. Finally, bill and keep is most likely to satisfy the *NPRM*'s goal of devising a single, *unified* compensation mechanism for all three forms of interconnection. The idea here is not that carrier-to-carrier payments should occur at the same *rate* for all three forms of interconnection, but rather that there should be only one means of recovering cost regardless of the form of interconnection involved. Bill and keep, unlike a CPNP-based mechanism, does not base compensation on how cost is caused. However, it avoids the contentious issue of having to determine how *much* cost needs to be recovered from other carriers.

33. For all of these reasons, bill and keep is the policy instrument that is most likely to achieve the goals of the *NPRM* in the presence of real-world distortions (some of which are legacies of past public policies and are unlikely to disappear). It cannot be sufficient to try rehabilitating present-day CPNP-based compensation mechanisms by making some minor modifications, as some parties in this proceeding have proposed. Doing so would only help to mythologize the "perfect world" postulate on which CPNP-based compensation mechanisms are based. In this instance, realistic and responsible policy-making must entail looking beyond ideal circumstances and, in particular, recognizing the distortions that exist currently and are likely to persist in the foreseeable future.

III. RESPONSE TO CRITIQUE OF BILL AND KEEP BY OTHER PARTIES

A. Other Parties Err In Attempting To Retain CPNP-Based Compensation, Even With Interconnection Charges Based On Allegedly Forward-Looking Cost

1. CPNP-Based Compensation Should Not be the Preferred Instrument for the Goal of a Single, Unified Compensation Mechanism for All Forms of Interconnection

34. The principal justification advanced by other parties (e.g., *Ordover-Willig*, ¶27; AT&T, at 22) for CPNP-based compensation is that it is rooted in the principle of cost causation. We disagree with this premise for several reasons. First, a compensation mechanism based on cost causation[19] is only likely to be efficient in ideal circumstances. Given the pervasive and enduring nature of existing regulatory and market distortions, however, the *Ordover-Willig* prescription has virtually no hope of working as intended in reality.

35. Second, Professors Ordover and Willig have failed to note that CPNP-based compensation is *not* automatically cost-causative in all circumstances.[20] CPNP-based compensation, as currently practiced widely for Internet-bound traffic (namely, reciprocal compensation), is decidedly not cost-causative. That is because reciprocal compensation obliges the Internet caller's originating LEC, not—as would be truly cost-causative—the ISP that provides Internet access service, to pay compensation to other within-PSTN carriers that help to carry the Internet-bound call. The payment of such compensation by the Internet caller's

[19] This principle holds that:

- The calling party is always the *cost-causer* for a call (i.e., the cost of the call would be avoided if the calling party did not make an economic decision to place the call).
- The carrier that provides the service used by the cost-causing customer is (1) the cost-causer's *agent* and (2) should be responsible for recovering the cost of the call and compensating other carriers involved in carrying the call to its intended destination.

Therefore, the IXC is the cost-causer's agent for a long distance call, the originating LEC is the cost-causer's agent for a local voice call, and the ISP is the cost-causer's agent for an Internet-bound call. All other carriers involved in the carriage of those calls are merely co-carriers or call facilitators.

[20] *Ordover-Willig*, ¶51, is an example of this.

LEC may make it, literally, a calling party's *network* pays arrangement, but it does not make it cost-causative. The ESP exemption prevents any recovery of cost directly—through usage-sensitive charges—from ISPs, which are regarded by the FCC presently as a class of ESPs. Hence, the ESP exemption acts as a distortion that drives a wedge between what is truly cost-causative and the supposedly CPNP-based compensation mechanism that currently exists for Internet-bound traffic.[21]

36. Third, even the fact that a supposedly cost-causative CPNP-based compensation mechanism can, in the presence of distortions, generate unlimited opportunities for regulatory arbitrage seems not to bother other commenters at all.[22] For example, *Selwyn-Lundquist* (at 30) states:

> In a competitive local telecom market, carriers—including the ILECs themselves—are free to compete for call termination business. If a CLEC is able to furnish the call termination service more efficiently than the ILEC, the goals of competition are served when customers are induced to switch from the ILEC to a CLEC for this service.

Selwyn-Lundquist then goes on to state (at 31):

> Under a system of explicit reciprocal compensation payments *and as long as the ILEC's rates are based upon the ILEC's costs*, there is no logical connection between the traffic flow and associated compensation due in one direction, and the traffic flow and compensation that might occur in the reverse direction. In fact, if the symmetric reciprocal compensation rate is set *at the ILEC's cost*, then only those CLECs that are able to provide call termination services more

[21] Semantics aside, a "Calling *Party* Pays" compensation mechanism would more accurately be cost-causative because the calling party is always the cost-causer. Reciprocal compensation—which is a cost-causative form of cost recovery *only* for local voice traffic—currently applies to Internet-bound traffic in several state jurisdictions. It is little wonder then that the greatest negative fallout from a supposedly CPNP regime for inter-carrier compensation has occurred in relation to Internet-bound traffic. The FCC's own deep ambivalence about such an arrangement is clear from its *ISP Declaratory Ruling* (although its analysis is based more on jurisdictional distinctions than on cost causation). Despite this, *Selwyn-Lundquist* continues to champion reciprocal compensation for Internet-bound traffic and to characterize the arbitrage that results from it as "competitive losses" suffered by ILECs. This characterization is doubly wrong: reciprocal compensation for Internet-bound traffic is neither a *cost-causative* CPNP regime in the *Ordover-Willig* sense, nor is it efficient in *any* sense (because competitive entry is motivated by arbitrage opportunities, rather than by true competitive advantage).

[22] In contrast, the FCC has frequently expressed its concerns with such arbitrage, and the *NPRM* has emerged out of just such concerns.

> efficiently than the ILEC will elect to engage in this market segment. [emphasis in original]

37. Taken together, a reasonable inference from the two statements could be that when the rules of the game are set up to provide a CLEC reciprocal compensation for delivering Internet-bound calls to ISPs at a symmetrical rate pegged to the *ILEC's* cost to terminate a local *voice* call, CLEC specialization in serving ISPs (what *Selwyn-Lundquist* terms "high-volume call termination services") is only to be expected. On that, we agree with Dr. Selwyn and Mr. Lundquist; indeed, with incentives set up that way, it is perfectly rational for unregulated CLECs, who are free to enter and operate in the local market as they will, to respond in that matter.[23] However, we strongly disagree that this is good local competition or even good *for* local competition. What *Selwyn-Lundquist* describes in glowing terms is nothing but arbitrage that occurs in response to a market distortion. In this instance, it is the symmetrical reciprocal compensation rule based on the ILEC's cost to terminate a local voice call despite cost differences among ILECs and CLECs. While arbitrage may be *privately* good, i.e., good for the CLECs specializing in call termination, it is definitely not in the public interest. The 1996 Act made a particular point of creating the conditions for vigorous and efficient local exchange competition, i.e., for the full gamut of local exchange services including both call origination and termination. It certainly never envisioned the rise of a local exchange market in which only the ILEC (and possibly a handful of other carriers) provides—indeed, is constrained by public policy to provide—the full spectrum of local exchange services, while the majority of new competitive carriers enter the market only as rent-seekers, i.e., in pursuit of arbitrage profits.

38. Finally, it is important not to lose sight of policy-makers' major predicament when implementing CPNP-based compensation mechanisms in a world of imperfect and asymmetric information. Those compensation mechanisms can only hope to deliver

[23] In contrast to the regulated, full-service ILEC, an unregulated CLEC can freely choose (1) the customers it wishes to serve, (2) the services it wishes to provide, and (3) the network it needs to serve those interests. The phenomenon of ISP-specializing CLECs, i.e., CLECs established purely to earn reciprocal compensation revenues from substantial inflows of Internet-bound traffic, has been noted for some time by the FCC (*Internet Remand Order*, ¶5, and *NPRM*, ¶11) and state regulators (Massachusetts Department of Telecommunications (continued...)

economically efficient outcomes if all carriers are compensated for costs they *actually* experience. That is, carrier-to-carrier payments can only be efficient when no carrier has either the incentive or the ability to receive compensation that exceeds its share of the cost of carrying a call.[24] Unfortunately, imperfect and asymmetric information acts as a constraint or distortion in this matter as well. Only the carrier that experiences a cost can be in a position to know—or influence—*how much* cost it incurs. An additional asymmetry in this matter arises because of the manner in which cost is revealed or disclosed. While the regulated ILEC's share of the cost receives substantial regulatory scrutiny, the unregulated CLEC's (or some other carrier's) share of the cost is rarely visible or known to policy-makers. If a form of CPNP-based compensation is in place that encourages regulatory arbitrage, then it is particularly unlikely that policy-makers can overcome their imperfect knowledge of the costs of unregulated carriers or new entrants to ensure that the costs that are compensated are only those actually incurred. This problem can be particularly acute when different forms of interconnection generate different levels of cost. Hence, in seeking a single, unified form of inter-carrier compensation, the only feasible solution can be to shift the focus from accurately determining how much cost needs to be compensated under a system of carrier-to-carrier payments to a system in which all carriers (who must know their own costs) seek recovery directly from their end-users. The virtue in the latter arrangement is clearly that no carrier can gain anything from playing games about its cost; rather, in order to compete, it must set end-user rates that truly reflect its actual costs. It also dispenses with the troublesome dependence of efficient CPNP-based compensation on the omniscience of policy-makers. Bill and keep is an effective policy alternative in a world of imperfect and asymmetric information.

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and Energy, *Order* in Docket No. 97-116-C, May 1999, and Colorado Public Utilities Commission, *Initial Commission Decision* in Docket 00B-011T, May 3, 2000).

[24] When one carrier compensates another for causing cost on its network, the compensated carrier has an incentive to overstate the cost it experiences (or, at an externally fixed rate of compensation, lower the cost it actually experiences).

2. TELRIC-Based Compensation Is Not A Panacea For Current Problems With CPNP

39. Other parties in this proceeding have contended that all problems would disappear if interconnection rates were only set at TELRIC.[25] The real-world problem is that the tariff structure required for all LECs to face interconnection rates that adequately reflect their *actual* costs is simply too complex to implement. The asymmetric information problem makes it unlikely that, for *every* bilateral interconnection arrangement, the respective costs —even measured at TELRIC levels—of both interconnecting carriers can be properly identified and interconnection prices set accordingly. In particular, since CLECs are free to seek out particular types of customers but ILECs are not (at least to the same extent), any systematic difference between price and cost will inevitably give rise to arbitrage opportunities.

40. AT&T (in particular, *Ordover-Willig*, ¶20) recognizes that the regulator's task of setting cost-based termination rates will remain difficult because of imperfect and asymmetric information about costs. However, Professors Ordover and Willig assert that bill and keep is not likely to alleviate that difficulty but would, instead, require greater regulatory scrutiny of end-user charges. We do not deny that end-user charges would remain regulated under bill and keep, but end-user charges will be pervasively regulated anyway, irrespective of carrier interconnection arrangements. Thus, contrary to the opinion of Professors Ordover and Willig, bill and keep would require less regulatory intervention than CPNP as practiced in the current environment. Of course, end-user prices would have to remain regulated until competitive forces became adequate to control them. Bill and keep, however, would add nothing to that complexity. On the other hand, bill and keep would remove the complexity inherent in regulating carrier-to-carrier compensation rates, primarily by relieving regulators of the immense burden of accurately determining termination costs of a wide variety of carriers. Moreover, as competition increases for local exchange services at the end-user level, market forces, rather than regulation, would increasingly take over the responsibility of disciplining end-user prices.

[25] See fn. 16.

41. Some parties claim (e.g., AT&T, at 15) that with TELRIC-based reciprocal compensation rates, the ILEC should be indifferent between whether it terminates a call or a CLEC terminates the call. This reasoning is incorrect because it is based on the wrong premise: the standard for TELRIC is the ILEC's own incremental cost of terminating a call, not the ILEC's *avoided* cost when a CLEC terminates or delivers the call. Frequently, e.g., when an ISP "becomes" its own CLEC, the ILEC avoids *no* costs when the CLEC receives an Internet-bound call.[26] Rather, the CLEC-provided switch and transport represent additional facilities that the ILEC would not need if it were to both originate the end-user's Internet-bound call and deliver it to an ISP.

42. Other parties also claim that if interconnection rates were set at TELRIC, the CLECs' current incentive to terminate or receive incoming traffic and to target customers accordingly—whether end-users or ISPs—would disappear. This may be true in theory, but there are several practical obstacles. First, there is no guarantee that CLECs would voluntarily disclose their true costs without extensive investigation by outside neutral agencies. Second, even if true costs were known and interconnection rates set equal to them, the terminating access monopoly problem would remain and CLECs may have no incentive to minimize their reported costs. Finally, even while acknowledging that the level and structure of reciprocal compensation rates for Internet-bound traffic could be modified to overcome the current arbitrage problem, the FCC has still set fixed (and *symmetrical*) per-minute rates for its transitional reciprocal compensation rates.[27]

3. TELRIC is Neither the Appropriate Measure of Forward-Looking Incremental Cost Nor Relevant to the Choice Between a CPNP Regime or Bill and Keep

43. In the larger scheme of things, setting interconnection rates at TELRIC is not even the relevant issue for this proceeding. The *NPRM* asks for a comparison of CPNP-based compensation with bill and keep. In their response, Professors Ordover and Willig

[26] ISPs have been known to set up their own CLECs for the sole purpose of receiving one-way flows of Internet-bound traffic and collect reciprocal compensation revenues in the process.

[27] *Internet Remand Order*, ¶8.

advocate CPNP-based compensation, provided that interconnection rates are set at forward-looking long run incremental cost (*Ordover-Willig*, ¶39). Although they do not specifically identify such cost as TELRIC, their reference to the *Local Competition Order*, ¶¶672-703, strongly suggests that they have the TELRIC standard in mind. Although, for reasons provided below, we believe that TELRIC is an improper measure of forward-looking long run incremental cost, it should be understood that *any* CPNP-based compensation mechanism—whether or not based on the TELRIC standard—will be an inferior policy as long as the various systemic and structural distortions identified in this Reply Declaration persist.

44. Setting rates at TELRIC levels for *all* forms of interconnection is a bad idea from an economic standpoint for several reasons. First, TELRIC—at least the interpretation of TELRIC advocated by CLECs—misrepresents the actual costs of an incumbent carrier by, in effect, requiring it to pretend that it possesses the most efficient network that has in place the most recent technology, and that it upgrades that network continually (rather than discretely as happens in the real world).[28] TELRIC levels are not those to which competition would drive prices for input services, particularly in industries with large fixed costs and economies of scale and scope. Closely tying prices for those services to fictitious costs—such as TELRIC—would only stifle investment and the incentive to innovate.[29]

45. Second, TELRIC-based pricing with arbitrary allocations of shared and common costs (usually prescribed by the regulator) is neither efficient nor feasible under competition. Such pricing would not enable the ILEC to recover its total direct costs, nor would it compensate the ILEC for its economic costs inclusive of opportunity costs. Also, TELRIC

[28] Statement of Alfred E. Kahn, USTA Reply Comments, Attachment 1, in FCC, *In the Matter of Access Charge Reform*, CC Docket No. 96-262, February 14, 1997, at 6 Also see Richard Schmalensee and William E. Taylor, "Economic Aspects of Access Reform: A Reply," USTA Reply Comments, Attachment 3, in the same proceeding.

[29] *Id*., at 10-11.

pricing would not permit the ILEC to have dynamic pricing flexibility; rather, it would discriminate in favor of entrants and against the ILEC.[30]

46. Third, while TELRIC may serve as an approximate price *floor* for access or interconnection services, it cannot signal the appropriate market price for any of those services. For a multiproduct ILEC with substantial fixed costs, TELRIC-based pricing cannot recover all of its long run costs reliably and sustainably.[31] Indeed, the post-divestiture experience has clearly shown that pricing carrier access services at incremental cost is not necessary for efficient entry into either the inter- or intraLATA long distance markets.[32]

47. Finally, the FCC has itself on multiple occasions signaled its preference for market-based pricing of carrier access services over a prescriptive form of pricing, such as represented by TELRIC with arbitrary allocations of shared and common costs.[33] The same principle should apply to all forms of interconnection.

4. TELRIC-Based Compensation Is Incompatible With Universal Service And Other Regulatory Goals

48. As long as interconnection rates (particularly carrier access charges) remain an instrument for pursuing social goals like universal service, a complete change to TELRIC-based interconnection rates for inter-carrier compensation cannot be feasible. LECs (both large and rural) cannot then fund and support universal service programs. Even if the FCC pulled all implicit subsidies out of *inter*state access charges, this problem would remain if the states did not follow suit with similar reform for *intra*state access charges.

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[30] Affidavit of J. Gregory Sidak and Daniel F. Spulber, USTA Comments, Attachment 3, in FCC, *In the Matter of Access Charge Reform*, CC Docket No. 96-262, January 29, 1997, at 33.

[31] Richard Schmalensee and William E. Taylor, "Economic Aspects of Access Reform," USTA Comments, Attachment 3, in the same proceeding, at 17.

[32] *Id*., at 21.

[33] FCC, *In the Matter of Access Charge Reform* (CC Docket No. 96-262), *Price Cap Performance Review for Local Exchange Carriers* (CC Docket No. 94-1), *Transport Rate Structure and Pricing* (CC Docket No. 91-213), and *End User Common Line Charges* (CC Docket No. 95-72), First Report and Order ("*Access Reform First Report and Order*"), released May 16, 1997, ¶¶262-274. Also see *CALLS Order*, ¶¶36-63, esp. ¶¶59-60.

49. Even if all support to universal service (at both federal and state levels) were made explicit, IP technology could still allow IXCs to resort to IP telephony to carry long distance traffic, be re-classified as information service providers, and thereby qualify for the ESP exemption from carrier access charges. This would allow the IXCs to avoid participating in the support of universal service.

50. AT&T argues (at 8) that a "minute is a minute" and that the FCC's reform should be pervasive so that a single termination rate (presumably set at TELRIC) would apply to all forms of interconnection. While this may be correct in theory, there are a number of constraints that would make bill and keep a more practical alternative to CPNP-based compensation. First, there is a question as to whether per-minute termination costs, even measured at TELRIC, are the same for all forms of interconnection. Second, even if they were, there is still the question of the actual termination costs of all carriers that seek interconnection. To imagine that they are all the same would be a considerable leap of faith. To imagine that those carriers would voluntarily reveal their actual costs would be even worse. As long as incentives for arbitrage exist (because of informational and regulatory asymmetries), the theoretically pure result envisioned for CPNP is unlikely to materialize. While bill and keep is not theoretically pure from a cost causation standpoint, it does have the merit of forcing each carrier to confront its own true costs.

B. Other Parties' Concerns About Bill and Keep As The Appropriate Unified Method Of Compensation In The Presence Of Multiple Distortions Are Misplaced

51. AT&T and *Ordover-Willig* (¶¶27-30) argue that only the cost causation principle (and a CPNP regime) provides a framework for internalizing both positive and negative externalities that frequently arise from telephone calls for which only the calling party pays. Professors Ordover and Willig reject the suggestion made by some observers that cost causation is actually shared between the calling party and the called party because both benefit from calls between them. While we recognize the externalities that underlie the

Ordover-Willig position,[34] we do not rely on any benefit-sharing principle to conclude that bill and keep should be the preferred compensation mechanism in current and foreseeable future circumstances. In the presence of multiple regulatory and market distortions, CPNP-based compensation is not first-best efficient. Instead, rather than being a solution, it becomes a part of the problem. Bill and keep, on the other hand, is better suited to deliver the single, unified compensation mechanism sought by the *NPRM*.

52. State-regulated, flat-rated, universal service-laden end-user charges for local exchange service have never done a particularly good job of reflecting cost causation. This fact remains true under the present CPNP regime and will not change under bill and keep unless the manner in which end-user rates are set is itself changed. Under CPNP today, end-user rates for basic exchange and local calling services reflect the costs of originating *and* terminating local calls, simply because roughly 90 percent of all such calls originate and terminate within the ILEC's network itself. No matter how these rates are arrived at, CLECs have to compete against those prices in the market for business and residential end-users. This fact would not change under bill and keep. For rates averaged across different customer types, ILECs would continue pricing so as to recover the average cost of originating and terminating local calls, and market forces would force CLECs to match or beat those prices.

53. We disagree with Professors Ordover and Willig, however, on their analysis of the effects of bill and keep in the presence of negative externalities (such as when a called party receives undesirable or unsolicited calls from telemarketers). They believe that when costs of unwanted calls are shared between calling and called parties, in effect shifting to the called party some of the cost caused by the calling party, there is an incentive for the calling party to call even more although the called party suffers a welfare loss in the process.

[34] We note that this premise assumes that both parties necessarily benefit from the call. As the problem of negative externalities shows, that is not always the case (particularly for the called party). In addition, to reach a bill and keep policy prescription in this manner, it has to be assumed that the benefits to the two parties arise in *equal* proportions so that cost may be split equally between them (or, in effect, allow for bill and keep). We agree with *Ordover-Willig* (¶32) that this is an unsupported assumption, and note that there is no market mechanism to observe the benefit received by the called party (indeed, that party's demand for incoming calls). That is why that benefit is treated as a positive externality which gets internalized when the called party returns the call on another occasion.

Contrary to these fears, we conclude that, in an environment with averaged, flat-rated end-user charges, bill and keep will not give telemarketers any new incentive to increase the number of calls they make. Under bill and keep, both average originating *and* terminating costs imposed by end-users on a carrier have to be recovered in end-user charges. While such cost recovery is not aligned with cost causation (*Ordover-Willig*, ¶23), it is no different from how cost is recovered today in a CPNP regime: with averaging across *both* originating and terminating calls and customers with different cost characteristics. AT&T's claim that end-users would have to pay to receive calls under bill and keep applies equally to the current CPNP regime in which end-users pay for both origination and termination costs in their end-user charges. Therefore, telemarketers would continue to face the same composite end-user charges under bill and keep as they do today, and this fact should leave their behavior unchanged.

54. AT&T claims (at 6) that bill and keep makes no economic sense unless traffic is in balance. Indeed, *Selwyn-Lundquist* (at 36) believes that bill and keep cannot serve as a replacement for reciprocal compensation until traffic is in balance. These claims are shortsighted. It is true that when traffic is *already* in balance, bill and keep would have no effect other than to allow both carriers to save on the transactions costs associated with billing and collection.[35] That does not mean, however, that traffic balance is an exogenous event. We believe that the balance of traffic is actually a function of the interconnection regime and prices, and the theory that the relationship runs in the opposite direction only puts the cart before the proverbial horse. When reciprocal compensation at symmetrical rates is enforced, but the termination *costs* of the two carriers are different *and* one carrier has more flexibility than the other in choosing whom to serve, what services to provide, and how to design its

[35] The issue of "balanced traffic" should be treated with some caution. Bill and keep would save on transactions costs only if payments between the interconnected carriers were to offset. If it is the physical *volume* of traffic, i.e., minutes of use, that is in balance, then payments between carriers would only offset if the minutes of use exchanged in both directions were charged the *same* interconnection (or reciprocal compensation) rate. Otherwise, with non-symmetrical reciprocal compensation, it is possible for payments to offset and, hence, to justify bill and keep *without* balance in the physical volume of traffic itself. Finally, we note that whether or not traffic is balanced does not depend on the relative sizes of the networks of interconnected carriers. That is, balanced traffic does not require that either network serve roughly the same number of end-users.

network accordingly, then a powerful incentive exists for one-way traffic to develop.[36] Under bill and keep, on the other hand, traffic would be, or become, more balanced because no LEC would have an incentive to seek out customers with radically different calling characteristics—mainly because end-user prices would reflect average costs of *both* origination and termination. We concede that, with prices averaged across customer types, there would always be an incentive (albeit smaller than under CPNP where actual money is involved) to seek out flat-rated customers who originate or terminate few calls. The opposite incentive could arise as well because customers with high calling rates also generate more long distance and vertical service revenues.

55. AT&T (in particular, *Ordover-Willig*, ¶14) asserts that bill and keep would not emerge as a "unique equilibrium interconnection and access regime in an effectively competitive telecommunications market." Professors Ordover and Willig also assert that, under competition, end-users would avoid carriers that exchange traffic subject to bill and keep, and carriers would respond accordingly by rejecting bill and keep arrangements. We find it hard to believe that, in a competitive market, end-users would actually shop for LECs on the basis of whether or not those LECs operate under bill and keep arrangements. Instead, all that end-users are likely to care about are the prices for retail or end-user services. Under bill and keep, LECs' end-user charges would include the cost of originating and terminating traffic just as they do today, and as they would even under an *idealized* CPNP regime of the sort advocated by AT&T. To find the most attractive service plan, end-users would have to look no further than the prices charged by the ILECs and CLECs that compete to serve them.

56. AT&T (in particular, *Ordover-Willig*, ¶¶57-59) also complains that, under bill and keep, IXCs would lose control of the end-to-end prices of their long distance services but ILECs authorized to offer interLATA long distance services would not. Professors Ordover and Willig are specifically concerned with the possibility that ILECs could refuse to offer

[36] In a fundamental way, this phenomenon stems from the basic law of demand which states that usage is, *ceteris paribus*, a function of prices. Moreover, this phenomenon has already been observed to a convincing degree for Internet-bound traffic.

access to IXCs at a uniform rate for all hours of the day. This, they allege, would prevent IXCs from offering uniform prices at all times for their long distance service. This analysis loses sight of the fact that under a minute-is-a-minute implementation of bill and keep, there would be no specific access charges to assess on end-users. Instead, when making long distance calls, end-users would, in effect, make local calls to IXC points of presence ("POPs") and, at the terminating end of those long distance calls, the IXC POPs would, in effect, place local calls to called end-users.[37] Those end-user local rates would remain pervasively regulated under bill and keep (until competition for end-users makes regulation unnecessary). Moreover, in this scenario, the ILEC's long distance customers would pay the same end-user local rates as the IXC's long distance customers.

57. AT&T asserts (at 17) that a modified CPNP regime would address carrier access and the so-called terminating access monopoly concerns by establishing cost-based rates for terminating access, while bill and keep would not do so. That modified CPNP, however, would be a bad regulatory solution. While ILEC terminating access rates have been pervasively regulated and are transitioning toward equilibrium levels, CLEC terminating access rates would be a more difficult regulatory problem. In fact, CLECs—even those with tiny shares of the end-user market—possess the same ability to charge prices in excess of the competitive level as does a regulated ILEC with a much larger market share. This is borne out by recent complaints by IXCs against excessive access charges allegedly charged by CLECs. As we explained earlier, it is likely to be considerably more difficult for regulators to ensure that unregulated CLECs voluntary reveal their true forward-looking costs and set access charges accordingly.

58. Bill and keep will likely go a long way toward solving the terminating access monopoly problem. Until technology can assure every end-user instant access to, and choice of, several competing carriers for the purpose of terminating incoming calls, the cost of

[37] Under bill and keep, a long distance call would consist essentially of two local calls at the two ends of the call and long distance transport in between. Because the two local calls would be charged for under end-user tariffs, an IXC and a LEC eligible to provide long distance service need only compete on the price each charges for long distance transport. Hence, the allegation that IXCs would lose control of their end-to-end price for long distance service is, in essence, irrelevant.

termination itself is not something that the originating carrier can affect. In contrast, many end-users presently have real-time options with respect to how their calls are originated. Under the CPNP regime currently practiced, the originating carrier remains obliged to compensate the terminating carrier at a fixed rate linked to its *own* cost, even if the terminating carrier's cost is lower. Alternatively, if the terminating carrier can demonstrate that its cost is actually higher than what it is currently allowed to charge, then it becomes eligible for even greater compensation.[38] However, *even if* the terminating carrier were obliged to receive compensation linked to its *own* cost, it would lose any incentive to minimize its termination cost. That would be because (1) a compensation rate tied to its own cost would deprive it of any profit opportunities and (2) being the sole source of termination for a given call, it would have no particular incentive to lower its cost and charge less. In these circumstances, bill and keep would remove whatever economic advantage presently accrues to carriers at the termination end of calls. Knowing that they would have to recover their termination costs from their own end-users, those carriers would be pushed by a competitive market for end-users to minimize the termination cost burden they pass on to end-users.

C. Alleged inefficient incentives for transport under bill and keep are overstated.

59. An alleged problem with COBAK or other forms of bill and keep is a distorted incentive for one carrier, say, *A*, to want to interconnect with another carrier, say, *B*, at the point which minimizes only the cost to *A*. (e.g., *DeGraba*, 15-16, *Farrell-Hermalin*, at 8). In practice, this distortion is likely to be small because the economic cost of transport is small, and while the cost consequences of choosing different points of interconnection would not be zero, they would also not likely matter a great deal.

[38] FCC, *In the Matter of Local Competition Provisions in the Telecommunications Act of 1996*, CC Docket No. 96-98, First Report and Order ("*Local Competition Order*"), released August 19, 1996, ¶1089 and ¶1092. Also see the safe harbor provision for rural CLECs in FCC, *In the Matter of Access Charge Reform* and *Reform of Access Charges Imposed by Competitive Local Exchange Carriers*, CC Docket No. 96-262, Seventh Report and Order and Further Notice of Proposed Rulemaking, released April 27, 2001, ¶¶64-68.

60. *Ordover-Willig* (¶23) asserts that even if bill and keep were to solve the problem of monopolistic termination charges (essentially by eliminating inter-carrier payments), "market power [by ILECs] could … just as easily be exercised through transport or trunk port charges." While we agree that continued regulation on this front may remain necessary into the foreseeable future, that would not require any greater regulatory commitment than under the current CPNP regime. While the need for regulation would remain in some areas, bill and keep would at least entail less regulation in others. *Ordover-Willig* (¶43) also attempts to establish some form of equivalence between constraining end-user prices through competition or regulation and constraining inter-carrier compensation rates in a CPNP regime by setting all rates at the level of forward-looking costs. We do not believe that such an equivalence exists. Professors Ordover and Willig are correct to state that end-user prices can be disciplined by both competition and regulation, with the former becoming the ascendant form of control as more LECs begin to vie for end-users. However, the efficacy of regulation of inter-carrier compensation rates that relies on nothing less than omniscience on the part of regulators will always remain mired in doubt.

61. Other parties also assert that moving to bill and keep would fundamentally change the way that long distance traffic is routed, particularly with respect to the type of access facilities deployed to IXC POPs (e.g., *DeGraba*, at 15-16, and *Ordover-Willig*, ¶60). It is not clear why, under bill and keep, this should matter. Dr. DeGraba portrays the issue as an opportunity for an ILEC to raise the IXC's "cost of providing terminating access" relative to the ILEC's own such cost for a competitive long distance service. However, if one sees the long distance call under bill and keep as being, in effect, two local calls at the two ends and transport in the middle, then the IXC shouldn't really care. It is the ILEC whose actions with regard to the provisioning of the long distance call from it to the IXC's POP (or from the IXC's POP to it) that would determine whether they would keep or lose the end-user. It is hard to believe that the ILEC would not then have an incentive to minimize the cost of such access because, after all, it would have to recover that cost in its own end-user charges.

D. AT&T's Concerns About Price Squeeze Are Misplaced, And Irrelevant Under Bill And Keep

62. The claim by AT&T (*Ordover-Willig*, at ¶¶55-56) that the potential for price squeeze stems from an ILEC's ability to set carrier access charges above its economic cost of access is a well-worn economic fallacy.[39] When access charges are set above economic cost, the ILEC receives contribution from the access it sells to an IXC that serves the end-user for long distance service; however, it receives no contribution from access when it provides long distance service itself to the end-user. If the ILEC is then obliged to include at least as much contribution in the price of its long distance service as it earns in contribution when it sells access to an IXC, two things happen. First, with the same contribution accruing from access and retail long distance service, the ILEC is left financially indifferent between the two services and, therefore, with no particular reason to prefer providing one over the other. Second, the ILEC's retail price for long distance service cannot fall to price squeeze levels. Hence, irrespective of other regulatory safeguards, the ILEC and the IXC see precisely the same cost of access when they market and price their long distance services.[40]

63. The larger point, of course, is that price squeeze would be a non-issue under bill and keep with present-day carrier access charges eliminated. Bill and keep for LEC-IXC interconnection for long distance service would merely mean that the end-user making the long distance call would, in effect, make—and be charged—for a local call to the IXC's POP on the originating end and the IXC's POP on the terminating end would, in effect, make a local call to the called end-user. Without carrier-to-carrier payments, a price squeeze would not be possible.

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[39] A price squeeze occurs when a firm controls a facility essential to supplying service in a downstream (usually retail) market, and makes it available to its downstream competitors at a higher price than it effectively charges itself. Technically, a set of retail and wholesale prices constitutes a price squeeze if the retail price is less than the sum of (1) the incremental cost of the retail service and (2) the contribution (price less incremental cost) from supplying the wholesale service. In this circumstance, an equally efficient competitor cannot meet the retail price profitably while using the essential facility.

[40] This point can be made formally by calculating the profit-maximizing price of long distance service for a firm that provides long distance and carrier access services, and for which the gain of a minute of long distance reduces carrier access volumes by a minute. In this simple model, the profit maximizing price of long distance (continued...)

64. The FCC itself has rejected price squeeze allegations and concerns in the past. In its *Access Reform First Report and Order*, the FCC considered and then dismissed the possibility of successful predation and price squeeze by ILECs that provide carrier access service to IXCs with which they also compete to provide certain long distance services. The FCC offered several reasons for that dismissal: (1) price cap regulation limits an ILEC's ability to manipulate the price of interstate access service, (2) several and sufficient safeguards against price squeeze are available under Section 272 of the 1996 Act, (3) under the separations requirement, ILECs have to maintain separate books of account that make it easy for the FCC to detect any attempt to shift or improperly allocate costs and assets between an ILEC and its long distance affiliate, (4) the availability of unbundled network elements at cost-based prices makes it easy for new competitive entry to occur in response to any successful attempt at price squeeze, (5) the substantial operations of major national IXCs make it unlikely for any one of them to be driven into bankruptcy by price squeeze efforts of one or more ILECs,[41] and (6) sufficient protection against price squeeze is available from the antitrust laws.

IV. CONCLUSIONS

65. A cost-causative compensation mechanism like CPNP is first-best efficient only in ideal circumstances, i.e., a competitive market free of all market or policy-induced distortions. As currently practiced, however, CPNP-based compensation for interconnection among carriers does not work, primarily because of several systemic and structural distortions that are likely to persist into the foreseeable future. Such CPNP-based compensation is also not truly cost-causative for Internet-bound traffic. Thus, CPNP-based compensation does not

(...continued)

is a mark-up (depending on the price elasticity of demand) over the sum of (1) the incremental long distance cost and (2) the contribution from carrier access.

[41] The FCC also noted that even if an IXC were to meet with that fate, its substantial network facilities would remain available for another IXC to step in and undercut any effort by the price-squeezing ILEC to raise long distance prices.

(1) lead to efficient interconnection prices, (2) eliminate regulatory and other uneconomic arbitrage, (3) conserve transactions costs, or (4) reduce the need for regulatory intervention.

66. Even with interconnection prices set at TELRIC levels, CPNP would fail to be first-best efficient because of the multiple systemic distortions. Claims to the contrary do not account for the informational and regulatory asymmetries between ILECs and CLECs and between carriers and regulators. A CPNP regime, modified with all interconnection prices set at TELRIC, would still depend crucially on the accurate revelation of carrier's costs. Since this outcome itself depends on voluntary disclosure by a large number of unregulated carriers (mainly CLECs), the integrity and transactional efficiency of this process is in doubt. In addition, TELRIC-based compensation would wreak havoc on the pursuit of other social and regulatory goals by denying support for universal service. Finally, other distortions like the ESP exemption from access charges could induce long distance carriers to resort to IP telephony to carry their calls and rapidly dissipate the funding support for universal service and other social goals. No amount of setting carrier access charges at TELRIC would help if those charges could be avoided altogether.

67. In the presence of multiple regulatory and market distortions, bill and keep is best equipped to minimize opportunities or incentives for uneconomic arbitrage, reduce the need for regulatory intervention, reduce transactions costs (mainly those related to litigation, dispute resolution, and enforcement in the CPNP regime), and enable pricing structures to emerge that would make end-user charges of both ILECs and CLECs market-responsive. Again, absent ideal circumstances and any imminent move to remove existing regulatory and market distortions, bill and keep is a reasonable and responsible policy choice.

68. Claims made by other parties in favor of CPNP are self-serving and designed mainly to reduce all carrier access charges to TELRIC levels. By recovering all costs directly from end-users, bill and keep would avoid this controversy entirely, while preserving explicit support for universal service programs. Claims made by those parties against bill and keep are also false because it is unlikely to introduce any new distortions or arbitrage opportunities that currently do not exist under CPNP. Rather, bill and keep is likely to lead to more rational end-user charges and compel CLECs to compete with ILECs for all market

segments, not induce them to seek out niche segments through arbitrage. Therefore, as long as market and regulatory distortions exist, bill and keep would represent the best opportunity to design a single, unified compensation mechanism for carrier interconnection.

69. This concludes our Reply Declaration.

A UNIFIED INTER-CARRIER COMPENSATION MECHANISM FOR ALL FORMS OF INTERCONNECTION: CALLING PARTY'S NETWORK PAYS OR BILL AND KEEP?

Exhibit 1

Curriculum Vitae

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Dr. Taylor received a B.A. magna cum laude in Economics from Harvard College, an M.A. in Statistics and a Ph.D. in Economics from the University of California at Berkeley. He has taught economics, statistics, and econometrics at Cornell and the Massachusetts Institute of Technology and was a post doctoral Research Fellow at the Center for Operations Research and Econometrics at the University of Louvain, Belgium.

At NERA, Dr. Taylor is a Senior Vice President, heads the Cambridge office and is Director of the Telecommunications Practice. He has worked primarily in the field of telecommunications economics on problems of state and federal regulatory reform, competition policy, terms and conditions for competitive parity in local competition, quantitative analysis of state and federal price cap and incentive regulation proposals, and antitrust problems in telecommunications markets. He has testified on telecommunications economics before numerous state regulatory authorities, the Federal Communications Commission, the Canadian Radio-Television and Telecommunications Commission, federal and state congressional committees and courts. Recently, he was chosen by the Mexican Federal Telecommunications Commission and Telmex to arbitrate the renewal of the Telmex price cap plan in Mexico. Other recent work includes studies of the competitive effects of major mergers among telecommunications firms and analyses of vertical integration and interconnection of telecommunications networks. He has appeared as a telecommunications commentator on PBS Radio and on The News Hour with Jim Lehrer.

He has published extensively in the areas of telecommunications policy related to access and in theoretical and applied econometrics. His articles have appeared in numerous telecommunications industry publications as well as *Econometrica*, the *American Economic Review*, the International *Economic Review*, the *Journal of Econometrics*, *Econometric Reviews*, the *Antitrust Law Journal*, *The Review of Industrial Organization*, and *The Encyclopedia of Statistical Sciences*. He has served as a referee for these journals (and others) and the National Science Foundation and has served as an Associate Editor of the *Journal of Econometrics*.

EDUCATION

UNIVERSITY OF CALIFORNIA, BERKELEY
Ph.D., Economics, 1974

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HARVARD COLLEGE
B.A., Economics, 1968
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EMPLOYMENT

NATIONAL ECONOMIC RESEARCH ASSOCIATES, INC. (NERA)
1988- Senior Vice President, Office Head, Telecommunications Practice Director. Dr. Taylor has directed many studies applying economic and statistical reasoning to regulatory, antitrust and competitive issues in telecommunications markets. In the area of environmental regulation, he has studied statistical problems associated with measuring the level and rate of change of emissions.

BELL COMMUNICATIONS RESEARCH, INC. (Bellcore)
1983-1988 Division Manager, Economic Analysis, formerly Central Services Organization, formerly American Telephone and Telegraph Company. While at Bellcore, Dr. Taylor performed theoretical and quantitative research focusing on problems raised by the implementation of access charges. His work included design and implementation of demand response forecasting for interstate access demand, quantification of potential bypass liability, design of optimal nonlinear price schedules for access charges and theoretical and quantitative analysis of price cap regulation of access charges.

BELL TELEPHONE LABORATORIES
1975-1983 Member, Technical Staff, Economics Research Center. Performed basic research on theoretical and applied econometrics, focusing on small sample theory, panel data and simultaneous equations systems.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Fall 1977 Visiting Associate Professor, Department of Economics. Taught graduate courses in econometrics.

CENTER FOR OPERATIONS RESEARCH AND ECONOMETRICS
Université Catholique de Louvain, Belgium.
1974-1975 Research Associate. Performed post-doctoral research on finite sample econometric theory and on cost function estimation.

CORNELL UNIVERSITY
1972-1975 Assistant Professor, Department of Economics. (On leave 1974-1975.) Taught graduate and undergraduate courses on econometrics, microeconomic theory and principles.

MISCELLANEOUS

1985-1995 Associate Editor, *Journal of Econometrics*, North-Holland Publishing Company.
1990- Board of Directors, National Economic Research Associates, Inc.
1995- Board of Trustees, Treasurer, Episcopal Divinity School, Cambridge, Massachusetts.

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The New Jersey Board of Public Utilities (Docket No. TO 00031063). Filed April 28, 2000. Rebuttal testimony filed May 5, 2000.
Federal Communications Commission, (CC Docket Nos. 96-98, 95-185, WT Docket No. 97-207), "Reciprocal Compensation for CMRS Providers," June 13, 2000 (with Charles Jackson).
Colorado Public Utilities Commission (Docket No. 00B-103T), June 19, 2000.
Federal Communications Commission, *In the Matter the Remand of the Commission's Reciprocal Compensation Declaratory Ruling by the U.S. Court of Appeals for the D.C. Circuit* (CC Docket Nos. 96-98, 99-68), July 21, 2000. Reply August 4, 2000.
Montana Department of Public Service Regulation (Docket No. D2000.6.89), July 24, 2000. Rebuttal filed February 7, 2001.
Washington Utilities and Transportation Commission (Docket 003013 Part B), filed August 4, 2000. Rebuttal filed February 7, 2001.
Nebraska Public Service Commission, (Docket No. C-2328), September 25, 2000. Rebuttal testimony filed October 4, 2000.
Montana Department of Public Service Regulation (Docket No. D2000.8.124: TouchAmerica Arbitration), October 20, 2000. Rebuttal filed December 20, 2000.
Arizona Corporation Commission (Docket Nos. T-03654A-00-0882,T-01051B-00-0882), January 8, 2001.
Florida Public Service Commission (Docket No. 000075-TP), filed January 10, 2001.
Colorado Public Utilities Commission (Docket No. 00B-601T), filed January 16, 2001.
Utah Public Service Commission (Docket No. 00-999-05), filed February 2, 2001. Rebuttal testimony filed March 9, 2001.
Arizona Corporation Commission (Docket No. T-00000A-00-0194, Phase 2), March 15, 2001.
Florida Public Service Commission (Docket No. 000075-TP), filed April 12, 2001.

Contract Services

Superior Court Department of the Trial Court (Civil Action No. 95-6363F), affidavit, July 1996.
Connecticut Department of Public Utilities (Docket No. 99-03-17), June 18, 1999.
American Arbitration Association, New York, *MCI WorldCom Communications Inc. v .Electronic Data Systems, Corporation,* Expert Report June 25, 2001. Supplemental Expert Report July 13, 2001.

Service Quality Performance Plans

Georgia Public Service Commission (Docket No. 7892-U), June 27, 2000.
Florida Public Service Commission (Docket No. 000121-TP), March 1, 2001. Rebuttal filed March 21, 2001. Rebuttal in Phase II filed April 19, 2001.
North Carolina Utilities Commission (Docket No. P-100 Sub 133k), May 21, 2001.
South Carolina Public Service Commission (Docket No. 2001-209-C), July 16, 2001.
Kentucky Public Service Commission (Docket No. 2001-105), July 30, 2001. Surrebuttal September 10, 2001.
Mississippi Public Service Commission (Docket No. 97-AD-321), August 2, 2001.
Tennessee Regulatory Authority, (Docket No. 01-00193), August 10, 2001.

Miscellaneous

New Mexico Public Regulation Commission (Utility Case No. 3147), December 6, 1999.
New Mexico Public Regulation Commission (Utility Case No. 3008), May 19, 2000.
United States District Court, District of Nevada (Case No. CV-S-99-1796-KJD(RJJ), December 28, 2000.

A UNIFIED INTER-CARRIER COMPENSATION MECHANISM FOR ALL FORMS OF INTERCONNECTION: CALLING PARTY'S NETWORK PAYS OR BILL AND KEEP?

Exhibit 2

Curriculum Vitae

Of

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November 5, 2001

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Dr. Banerjee is a Senior Consultant with the Communications Practice at NERA. He is responsible for providing analysis of, and expert witness testimony on, regulatory and economic issues of concern to telecommunications companies, preparing and responding to interrogatories in regulatory proceedings, and conducting econometric/statistical analysis to support marketing and market research activities of telecommunications companies. Dr. Banerjee works on a range of issues including Internet economics, price cap and incentive regulation, local and long distance competition, pricing of interconnection and unbundled services, reciprocal compensation, resale and avoided cost, benchmark and proxy cost models, and universal service. His market research activities are carried out, as needed, in collaboration with leading providers of telecommunications data or directly with telecommunications companies.

Before coming to NERA, Dr. Banerjee was a Research Economist (and internal economic consultant) at BellSouth Telecommunications where he was responsible for providing economic policy guidelines to key decision-makers and the Officer Body, preparing testimony and cross-examination questions, responding to interrogatories, and building econometric models to answer business questions. He provided quantification support for BellSouth's successful initiative of designing and securing price cap regulation for itself in each of its nine states, and contributed to BellSouth's policies on local and toll imputation, universal service, interconnection pricing, rate rebalancing, and per use pricing of vertical services. In the process, Dr. Banerjee collaborated with outside consultants from McKinsey and Company and Strategic Policy Research, Inc. He also represented BellSouth's participation in the National Telecommunications Demand Study, an ongoing study of demand trends in the telecommunications industry.

Prior to BellSouth, Dr. Banerjee was an economic consultant as a Member of the Technical Staff at Bell Communications Research and a Staff Supervisor at AT&T. Dr. Banerjee has several years of experience teaching graduate and undergraduate courses in economic theory, statistics, econometrics, industrial organization, and public finance. He has conducted research on the dynamics of futures markets and various aspects of time series econometrics. He has presented a number of papers on telecommunications economics issues at national business and academic conferences.

EDUCATION

THE PENNSYLVANIA STATE UNIVERSITY
Ph.D., Agricultural Economics, 1985

UNIVERSITY OF DELHI, INDIA
M.A., Economics, 1977

UNIVERSITY OF DELHI, INDIA
B.A., Economics (Honors), 1975

EMPLOYMENT

NATIONAL ECONOMIC RESEARCH ASSOCIATES, INC.

1995- Senior Consultant, Communications Practice. Responsible for applying economic theory, regulatory economics, and econometric analysis to a variety of tasks: supporting telecommunications firms in litigation and regulatory matters, market research, and strategic planning. Provide expert witness testimony and strategic advice.

BELLSOUTH TELECOMMUNICATIONS

1992-1995 Research Economist, Statistics and Econometrics Group. Developed, led, and disseminated economic and econometric research on issues of concern to BellSouth Telecommunications in particular and the telecommunications industry in general. Contributed to each of the following areas: regulatory economics, demand analysis (growth and elasticities), market potential, diffusion, pricing, cost, new product planning, forecasting, market research, competitive analysis, and the development of strategy/policy positions for BellSouth. Supervised and collaborated with other BellSouth economists and strategic planners and outside consultants.

BELL COMMUNICATIONS RESEARCH

1989-1992 Member of Technical Staff, Regulatory Economics and Pricing Theory, Demand Response Analysis Group. Developed various statistical and econometric methods and models that are applicable to the study of demand for various types of telephone service. The focus was on analysis, forecasting, and rate design support to client companies including BellSouth, U S West, NYNEX, and Bell Atlantic. Developed software for demand and market potential analysis using advanced

mathematical/statistical languages. Transformed original techniques research into business tools for analysts within client companies.

AT&T COMMUNICATIONS

1988-1989 Staff Supervisor, Market Analysis and Forecasting, Consumer Markets and Services. Assisted and contributed to demand analysis and forecasting efforts of the group. The focus was on demand issues related to AT&T's business and residential long distance telephone services.

THE PENNSYLVANIA STATE UNIVERSITY

1985-1988 Assistant Professor, Department of Economics. Developed and taught undergraduate and graduate courses in economics and econometrics. Conducted personal research in economics and econometrics. Supervised graduate student research leading to M.S. and Ph.D. degrees in economics. Developed the econometrics component of a new graduate program in policy analysis at Penn State. And, advised undergraduate economics students on their curriculum and course selection. Taught courses on introductory macro-economic theory, introductory and intermediate micro-economic theory, industrial organization, public sector economics, statistics, and introductory econometrics. Developed and taught advanced graduate econometrics and time series courses (frequency-domain econometrics and spectral analysis, dynamic simultaneous equations systems and state space models, causality, model testing and validation, nonlinear time series, and asymptotic theory.

1982-1985 Instructor, Department of Economics. Taught a number of undergraduate economics courses including macro-economic theory, micro-economic theory, public sector economics, and statistical foundations of econometrics.

1979-1982 Research Assistant, Department of Agricultural Economics & Rural Sociology. Assisted in research activities of Professor Robert D. Weaver of the Department of Agricultural Economics. Research areas included: stabilization of prices of internationally traded agricultural commodities; choice under risk-aversion by a firm faced with multiple sources of uncertainty; impacts of public policy on risk-averse firms; market efficiency, role of information, distribution of asset returns, and market equilibrium; and productivity and cost relations in the wheat, corn, and soybean producing areas of the U.S. using crop survey data from the U.S. Department of Agriculture. Most of the work consisted of literature research, writing computer programming, and econometric data analysis.

UNIVERSITY OF DELHI, INDIA

1977-1979 Lecturer, Department of Economics, Shri Ram College of Commerce. Taught undergraduate economics courses including micro-economic theory, public finance, and economic planning and policy.

HONORS AND AWARDS

Marquis' Who's Who in the South and Southwest, 1995-96
Gamma Sigma Delta Honor Society of Agriculture, inducted 1983
Phi Kappa Phi, inducted 1982

Department Head Award, BellSouth Telecommunications, 1993
Department Head Commendation, Bell Communications Research, 1992
Vice President's Award, Bell Communications Research, 1990

PAPERS AND PUBLICATIONS

CONTRIBUTIONS TO NERA REPORTS

"Efficient Inter-Carrier Compensation for Internet-Bound Traffic: Reply to Time Warner Telecom," (with William E. Taylor), ex parte with FCC on behalf of Qwest Corporation, October 23, 2000.

"An Economic and Policy Analysis of Efficient Intercarrier Compensation Mechanisms for ISP-Bound Traffic," (with Agustin Ros and William E. Taylor), ex parte with FCC on behalf of U S WEST Communications, Inc., November 12, 1999.

"Determining Fair and Reasonable Rates Under Competition: Response to Major Themes at the FPSC Workshop," for BellSouth Telecommunications, Inc., November 1998.

"Costing and Pricing Principles for Determining Fair and Reasonable Rates Under Competition," for BellSouth Telecommunications, Inc., September 1998.

"Local Telecommunications Competition: An Evaluation of a Proposal by the Communications Staff of the Florida Public Service Commission," with William E. Taylor, for BellSouth Telecommunications, Inc., November 1997.

"Costing and Pricing Principles for Competitive Telecommunications: A Critique of David Gabel's Recommendations," for BellSouth Telecommunications, March 1997.

"Comments (on Universal Service and the Hatfield Model)," with William E. Taylor, for BellSouth Telecommunications, Inc. (filed with the Federal Communications Commission for CC Docket No. 96-45), August 1996.

"Telephone Company Provision of Broadband Services: Economies of Scope, Competition, and Public Policy," for BellSouth Interactive Media Services, 1995.

"Economic Welfare Benefits from Rate Rebalancing," for Stentor Resource Centre Inc., 1995.

TESTIMONY

Rebuttal Testimony opposing Oregon Public Utility Commission Staff and other intervenors on adjustments to rate structure design proposed by Qwest Corporation for its intraLATA long distance services, on behalf of Qwest Corporation, Oregon Public Utility Commission, Docket No. UT 125 Phase II, May 3, 2001. [Appeared at Hearings, May 2001]

Rebuttal testimony opposing the position of Global NAPs, a competitive local exchange carrier, that it is owed reciprocal compensation for the carriage of Internet-bound traffic, on behalf of BellSouth Telecommunications, Inc., Florida Public Service Commission, Docket No. 991267-TP, December 20, 1999. [Appeared at Hearings, January 2000]

Affidavit, on behalf of the United States Telephone Association, Review of the Depreciation Requirements for Incumbent Local Exchange Carriers, CC Docket No. 98-137, November 23, 1998 (with William Taylor).

Affidavit supporting BellSouth Telecommunications Inc.'s motion to dismiss liability case brought by Public Storage Inc. of California because of lack of personal jurisdiction, before the U.S. District Court of the Central District of California, Case No. 90-3943 R (RZX), September 1998.

Affidavit and Reply Affidavit supporting the application by BellSouth Corporation for provision of in-region, interLATA services in Louisiana, Round 2, CC Docket No. 98-121, July-August 1998.

Affidavit and Reply Affidavit supporting the application by BellSouth Corporation for provision of in-region, interLATA services in Louisiana, CC Docket No. 97-231, October-December 1997.

Testimony critiquing the Hatfield Cost Model for setting unbundled network element rates for GTE in Alabama, on behalf of GTE South and Contel of the South in Arbitration with AT&T, Alabama Public Service Commission, Docket No. 25704, November 1996. [Testified at Hearings, December 1996]

Testimony critiquing the Hatfield Cost Model for setting unbundled network element rates for GTE in Texas, on behalf of GTE Southwest in Arbitration with ASCI, Texas Public Utility Commission, Docket No. 16,473, November 1996. [Testified at Hearings, December 1996]

Testimony critiquing the Hatfield Cost Model for setting unbundled network element rates for GTE in Oklahoma, on behalf of GTE Southwest in Arbitration with AT&T, Oklahoma Corporation Commission, Cause No. PUD 960000242, November 1996. [Testified at Hearings, November 1996]

Direct Testimony critiquing the use of the Benchmark Cost Model for setting the unbundled loop rate for BellSouth in Georgia, on behalf of BellSouth Telecommunications, to Georgia Public Service Commission, Docket 6759-U, October 1996. [Testified at Hearings, October 1996]

Consolidated Direct and Rebuttal Testimony critiquing bill and keep compensation for interconnection, on behalf of BellSouth Telecommunications, to Florida Public Service Commission, Docket 950985-TP (Petitions by Continental Cablevision, Metropolitan Fiber Systems of Florida, and MCI Metro Access Transmission Services), November 1995. [Testified at Hearings, January 1996]

Direct Testimony on unbundling by local exchange carriers and related cost issues, on behalf of BellSouth Telecommunications, to Florida Public Service Commission, Docket 950984-TP (Petitions by Metropolitan Fiber Systems of Florida, and MCI Metro Access Transmission Services), November 1995. [Testified at Hearings, January 1996]

Rebuttal Testimony critiquing bill and keep compensation for interconnection, on behalf of BellSouth Telecommunications, to Florida Public Service Commission, Docket 950985-TP (Petition by Teleport Communications Group), September 1995.

Direct Testimony addressing interconnection rate structure design, on behalf of BellSouth Telecommunications, to Florida Public Service Commission, Docket 950985-TP (Petition by Teleport Communications Group), September 1995.

Testified on behalf of BellSouth Telecommunications in Universal Service Proceeding, Tennessee Public Service Commission, Docket 95-02499, October 1995.

Wrote significant sections of NERA testimony/comments/affidavits presented to:

- state regulatory commissions on
    1. Price cap, local competition, interconnection, and unbundling issues (Arizona, Connecticut, Kentucky, Louisiana, Mississippi, Pennsylvania, New Mexico, Vermont)
    2. Regulatory Reform (Arizona)

3. Rate case (Arizona, New Mexico)
4. Universal service issues (Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, New Jersey, New Mexico, North Carolina, South Carolina, Tennessee)
5. Loop cost subsidies: measurement and testing (New Mexico, North Dakota)
6. Resale and avoided cost (Alabama, Louisiana, Tennessee)
7. Network Cost models (Alabama, Georgia, Massachusetts, Missouri, New Jersey, New York, Oklahoma, Pennsylvania, Texas)
8. Estimation of Loop Cost (New York)
9. Local company entry into interLATA long distance (Alabama, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee)
10. TELRIC pricing of unbundled elements (Alabama, Delaware, Maryland, Mississippi, New Jersey, North Carolina, South Carolina, Tennessee, Virginia, Washington DC, West Virginia)
11. Access charge reform (Arizona, Nebraska, Pennsylvania)
12. Rate rebalancing and welfare impacts (Ohio)
13. Pricing flexibility under price caps (New Mexico, North Carolina, Wyoming)
14. Cost recovery for Operations Support Systems and service quality and performance measurement (Alabama, Arizona, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee)
15. Reciprocal compensation for cellular, paging, and internet service providers (Alabama, Arizona, Colorado, Florida, Georgia, Idaho, Kentucky, Louisiana, Massachusetts, Mississippi, Montana, Nebraska, New Mexico, North Carolina, Oregon, South Carolina, Tennessee, Washington)
16. Payphone rates and new services test (Arizona, Louisiana, South Carolina, Tennessee)
17. Telephone company mergers (Arizona, Minnesota, Montana, Utah, Washington, Wyoming)
18. Reclassification of competitive services (Arizona, Nebraska, Washington)
19. Fair competition and promotions (Alabama)

- Federal Communications Commission in dockets or ex partes on
    1. CMRS interconnection (for NYNEX)
    2. Benchmark and proxy cost models (for BellSouth, Southwestern Bell, and NYNEX)
    3. Universal service (for BellSouth)
    4. InterLATA authority (for BellSouth)
    5. Access reform (for BellSouth)
    6. Regulatory forbearance for hicap services (for BellSouth)
    7. Depreciation reform (for USTA)
    8. Inter-carrier compensation for Internet-bound traffic (for U S WEST/Qwest)

9. Unified Compensation Mechanism for All Forms of Interconnection (for BellSouth)

- Canadian Radio-television and Telecommunications Commission in price cap proceeding (for Manitoba Telephone System)

- Telefonica Spain, on matters of reciprocal compensation

- Civil Action No. 94-324 (GK), FreBon International Corp. v. Bell Atlantic Corp., et al., Defendant's Expert Disclosure Statement

TELECOMMUNICATIONS-RELATED PAPERS

"Does Incentive Regulation "Cause" Degradation of Retail Telephone Service Quality?" 2001. Co-authored with Kalyan Dasgupta.

"Interconnection Rules and Inter-Carrier Compensation: Implications for Carrier Incentives and Economic Welfare," 2000. Co-authored with Agustin Ros.

"Telecommunications Privatization and Tariff Rebalancing: Evidence from Latin America" with Agustin Ros), *Telecommunications Policy*, Vol. 24, 2000, pp. 233-252.

"The Internet: Implications for Regulation and Public Policy," 1999. Co-authored with Agustin Ros.

"The Internet: Market Characteristics and Regulatory Conundrums," 1999. Co-authored with Agustin Ros. Forthcoming in *Forecasting the Internet: Understanding the Explosive Growth of Data Communications*, edited by Lester D. Taylor and David G. Loomis, Kluwer Academic Publishers.

"Using Covariances of Share Changes to Determine Substitutability" (an application to media advertising), 1997. Co-authored with Michael Salinger.

"The Case Against Imputation of Access Charges in IntraLATA Toll Prices: Economic Efficiency and Fairness Reconsidered," BellSouth Telecommunications, 1994.

"Pricing of Local Exchange Interconnection Service From the Perspective of Economic Theory," BellSouth Telecommunications, 1993.

"Economies of Scale and Scope, Subadditivity of Costs, and Natural Monopoly Tests for Regulated Utilities," BellSouth Telecommunications, 1993.

"Fairness and Economic Efficiency in Regulation: Imputation v. Equal Contributions in IntraLATA Toll Pricing," Report to the Task Force on Imputation of Access Charges in IntraLATA Toll Price, BellSouth Telecommunications, 1993.

"Economic Analysis of Efficient versus Imputation-Based Pricing by a Regulated Public Utility," Report to the Task Force on Imputation of Access Charges in IntraLATA Toll Price, BellSouth Telecommunications, 1993.

"**E**: A Maximum Likelihood Estimation Program, A User's Guide to Some Applications," Bell Communications Research, 1992.

"Error Components Panel Data Modeling of Share Equation Systems: An Application to Telecommunications Access Demand," Bell Communications Research, 1989.

"Analysis of Demand Migration and Take Rates for Special Access High Capacity Services," Bell Communications Research, 1990.

"Business Outbound Service System: An Empirical Modeling Framework," AT&T, 1989.

MISCELLANEOUS PAPERS

"Does Futures Trading Destabilize Cash Prices? Evidence for U.S. Live Beef Cattle," (with R.D. Weaver), Journal of Futures Markets, Vol 10(1), 1990, (pp. 41-60).

"Market Structure and the Dynamics of Retail Food Prices," (with R.D. Weaver and P. Chattin), Northeastern Journal of Agricultural and Resource Economics, Vol 18(2), 1989, (pp. 160-170).

"Cash Price Variation in the Live Beef Cattle Market: The Causal Role of Futures Trade," (with R.D. Weaver), Journal of Futures Markets, Vol 2(4), 1982, (pp. 367-389).

"Unemployment Rate Dynamics and Persistent Unemployment Under Rational Expectations: A Comment," (with V. Moorthy), Working Paper No. 8-87-1, Department of Economics, The Pennsylvania State University, 1987.

"The Standard Errors of Characteristic Roots of a Dynamic Econometric Model: A Computational Simplification," Working Paper No. 5-87-3, Department of Economics, The Pennsylvania State University, 1987.

"Market Structure, Market Power, and Dynamic Price Determination in the Retail Food Industry," (with R.D. Weaver), Working Paper No. 5-87-2, Department of Economics, The Pennsylvania State University, 1987.

"Does Futures Trading Destabilize Cash Prices? Evidence for Live Beef Cattle," (with R.D. Weaver), Working Paper No. 5-87-1, Department of Economics, The Pennsylvania State University, 1987.

"Existence of Portfolios with Simultaneous Trading in Unrelated Speculative Assets," Working Paper No. 8-86-2, Department of Economics, The Pennsylvania State University, 1986.

"Models of Cash-Futures Market Complexes for Commodities Characterized by Production Lags," Working Paper No. 7-86-2, Department of Economics, The Pennsylvania State University, 1986.

"Cash Price Stability in the Presence of Futures Markets: A Multivariate Causality Test for Live Beef Cattle," (with R.D. Weaver), Staff Paper No. 45, Department of Agricultural Economics and Rural Sociology, The Pennsylvania State University, 1981.

"Optimal Interpolation and Distribution of Time Series by Related Series Using a Spectral Estimator for the Residual Variance," Bell Communications Research, 1990.

"Size and Power Characteristics of Three Tests of Nonlinearity in Time Series," AT&T, 1989.

"Model Testing and Selection in Applied Econometrics," AT&T, 1989.

CONFERENCE PRESENTATIONS

"Does Incentive Regulation "Cause" Degradation of Retail Telephone Service Quality?" 20th Annual Eastern Conference of the Advanced Workshop in Regulation and Competition, Rutgers University, Tamiment, PA, May 23-25, 2001. Also presented at 19th Annual International Communications Forecasting Conference, Washington DC, June 26-29, 2001, and National Association of Regulatory Utility Commissioners, Summer Committee Meetings, Seattle, WA, July 17, 2001.

"Telecommunications Privatization and Tariff Rebalancing: Evidence from Latin America and Relevance to India," India Telecom 2000 Conference Keynote Speech, New Delhi, India, October 31-November 2, 2000.

"Interconnection Rules and Inter-Carrier Compensation: Implications for Carrier Incentives and Economic Welfare," (with Agustin Ros), 19th Annual Eastern Conference of the Advanced Workshop in Regulation and Competition, Rutgers University, Lake George, Bolton Landing, NY, May 24-26, 2000. Also presented at International Telecommunications Society 13th Biennial Conference, Buenos Aires, Argentina, July 2-5, 2000.

"The Internet: Implications for Regulation and Public Policy," (with Agustin Ros), 27th Annual Telecommunications Policy Research Conference, Alexandria, VA, September 25-27, 1999.

"The Internet: Market Characteristics and Regulatory Conundrums," (with Agustin Ros), International Communications Forecasting Conference, Denver, CO, June 15-18, 1999.

"Telecommunications Privatization and Tariff Rebalancing: Evidence from Latin America," (with Agustin Ros), 18th Annual Eastern Conference of the Advanced Workshop in Regulation and Competition, Rutgers University, Newport, RI, May 26-28, 1999.

"An Estimate of Current Universal Service Obligations and the Likely Impact of Federal and State Universal Service Plans," (with Agustin Ros and Neil Zoltowski), International Communications Forecasting Conference, St. Louis, MO, June 9-12, 1998.

"Competitive Telecommunications and its Aftermath: Economic Policy Issues and Modeling Needs," International Communications Forecasting Conference, Dallas, TX, April 16-19, 1996.

"On Modelling the Dynamics of Demand for Optional and New Services," International Communications Forecasting Conference, Toronto, Canada, June 13-16, 1995.

"The Case Against Imputation of Access Charges in IntraLATA Toll Prices: Economic Efficiency and Fairness Reconsidered," Rutgers University Advanced Workshop in Regulation and Public Utility Economics, Seventh Annual Western Conference, San Diego, CA, July 6-8, 1994.

"Future Directions in Modeling the Demand for Vertical Services," National Telecommunications Demand Study Conference, La Jolla, CA. March 24-25, 1994.

"**E**: A Maximum Likelihood Estimation Program," National Telecommunications Forecasting Conference, Crystal City, VA, June 1-4, 1993.

Discussant of "The National Telecommunications Demand Study," National Regulatory Research Conference on Telecommunications Demand, Denver, CO, August 3-5, 1992.

"Using Demographics to Predict New Service Take Rates: Discrete Choice Analysis vs. Categorical Data Analysis," National Telecommunications Forecasting Conference, Atlanta, GA, May 5-8, 1992.

"Price Cap Regulations for the LECs: Implications for Demand and Revenue Forecasting," National Telecommunications Forecasting Conference, Boston, MA, May 30, 1991.

"Demand Migration for Special Access High Capacity Services," Rutgers University Advanced Workshop in Regulation and Public Utility Economics, Third Annual Western Conference, San Diego, CA, July 11-13, 1990.

"Error Components Panel Data Modeling of Telecommunications Access Demand," Bellcore-Bell Canada Telecommunications Demand Analysis Conference, Hilton Head, SC, April 22-25, 1990, and Bell Atlantic Business Research Conference, Baltimore, MD, October 24-27, 1989.

"Analysis of Integrated Demand Systems," Rutgers University Advanced Workshop in Regulation and Public Utility Economics, Second Annual Western Conference, Monterey, CA, July 5-7, 1989.

Panel Discussion on "The Regulatory and Operational Impacts of Price Caps," National Telecommunications Forecasting Conference, San Francisco, CA, May, 1989.

November 5, 2001